can assure him that, while magistrate at Point Pedro, five-and-twenty years ago, I used almost nightly to see "rayons de crépuscule" in the most glorious perfection for months together. Point Pedro is the extreme northern point of the island, with a splendid sea horizon. I shall never forget the beauty of the tints. E. L. LAYARD

British Consulate, Noumea, New Caledonia, February 1

Salmon in Rivers of the Pacific Slope

IN a notice of the Report of the U.S. Commissioner of Fish and Fisheries, in NATURE, vol. xix. p. 430, the reviewer refers to the statement in a "memorandum respecting the American salmon and white fish recently introduced in New Zealand by Dr. James Hector," that "so far as yet observed, the adult fish all die after spawning and never return to the sea." The reviewer writes: "We shall be glad to have some authoritative statement with regard to the above fact, as without some explanation it seems too extraordinary for belief."

Dr. Hector in the above remark refers to the so-called "Californian Salmon" (*Salmo quinnat*) when in its native waters. There must be some exceptions to the rule as above stated, for Mr. Livingstone Stone, in his evidence in the same volume (p. 806), testifies that in the Columbia full-grown fish of this species are caught in considerable numbers, nearly exhausted, on the *back* of the drift-nets, in July and August, but it is nevertheless almost strictly true.

In the Fraser River, British Columbia, the general opinion is that the salmon never return to the sea except accidentally in a dying state. The Indians, who are generally well informed on such points, affirm this. The late J. K. Lord, in his "Naturalist in British Columbia," (vol. i. p. 40, *et seq.*), is very clear on the same point. It is, moreover, almost certain from the tumultuously rapid character of the Fraser, that the salmon hatched in its upper waters—in some instances 600 miles from the sea—never return there till mature and ready to spawn, and that this act is their last. They show no disposition to attempt to go back to the sea. I have seen them in great numbers in small streams tributary to the North Thompson, in August, spent, their silvery colour turned to a livid red (with the exception of the fins and tail, which are darker) but still heading persistently up stream, and continuing to do so, till from sheer weakness the current carried them away. In fording the brooks, the disturbance of the water causes those possessing sufficient vitality to scatter in all directions, but interrupts only for a moment their dogged struggle. At this season, in most years, dead salmon in great numbers are found floating down the stream, or stranded on the bars and banks of the river.

In Okanagan, Shuswap, and other lakes, there is a smaller fish, which may be a "land-locked" salmon, but of which I was not able to preserve specimens. The Indians say that it does not come from the sea, but lives in the deep waters of the lake, till in August it enters certain streams to spawn. Like the salmon it becomes, when spent, first blotched with pale red, and eventually altogether of that colour and without silvery lustre, the flesh at the same time losing its pink tint. It possesses the same instinct of struggling against the stream till it dies. I have seen them in brooks within a stone's throw of the lake, endeavouring with their remaining strength to keep themselves from being carried back into it.

Lord makes an exception of the "fall" or "dog-tooth" salmon (*S. lycaodon*), of which he supposes some go back to the sea, and return to the rivers in following years. It remains, however, an undoubted fact, that by far the greater part of the prodigious number of salmon entering the Fraser every year, perish. The fish appears to refuse food, and is not caught in the river by bait or fly, though frequently taken by trolling with fish or spoon-bait in the salt water.

It is much to be desired that a systematic investigation of the species of salmon frequenting the Fraser and other rivers of British Columbia should be made, embracing their habits and the course of their migrations. The subject is an interesting, but very intricate one. GEORGE M. DAWSON

Geological Survey of Canada, Montreal, March 27

The Marsupials of Australia

THE peculiarities of the structure of the marsupials of Australia are so remarkable and their habits are so unlike those of the placentals of the Old World, that probably no apology is needed for venturing to lay before your readers a short account of one of these peculiarities possessed by certain genera, which I believe has escaped the observation of most naturalists, and may prove interesting to some of your subscribers.

The inferior maxillary or lower jaw-bone of almost all known mammals consists of two bones united together with more or less rigidity by a strong cartilage, which allows no play or independent movement whatever, and which practically firmly unites them into one bone.

The formation of the inferior maxillary of the Macropidæ, or kangaroos, is an exception, however, to this rule; instead of being united by a cartilage, the two rami of the lower jaw are jointed at their point of contact with a hinge somewhat resembling that upon which the two shells of a bivalve move, that is, upon corrugations which project from the two edges and fit accurately into one another.

These two rami extend a short distance beyond the point of contact, and into their terminations are fixed two long procumbent incisor teeth, the only two incisors possessed by this family in the lower jaw. Immediately in front of this joint, that is, at the root of the procumbent incisors, a circular muscle embraces the two rami of the jaw, the contraction of which has the effect of bringing the inner edges of the procumbent teeth together; upon its relaxation or the contraction of another set of muscles, placed probably at the extremities of the rami, where they hinge upon the facial bones, the incisors are separated the extreme distance allowed them by the ligaments around the joint. The action of separating the teeth is probably connected in some measure with the action of opening the jaws, as I not unfrequently found that when the mouth was widely opened, the teeth themselves became separated.

The muscular action of uniting the incisors may be said to be exemplified in the case of a pair of shears when the blades are closed by a grasp of the hand, and the force is applied between the fulcrum and the point of resistance.

In Prof. Owen's work upon the "Anatomy of the Vertebrates," the following passage appears, showing that he was aware of a certain looseness of connection of the two rami, but probably not aware of the completeness of the construction with its separate functions. After certain references to the wombat he says, "In other marsupials the rami of the lower jaw are less firmly united at the symphysis; they permit independent movements of the right and left incisors in the kangaroos, and in the opossum both the rami of the lower jaw and all the bones of the face are remarkable for the loose nature of their connections."

In the work upon "Odontography" by the same distinguished writer, various references are made to the lower incisors of the macropidæ, but his readers are in every instance led to believe that their trenchant margin is their outer edge, and I believe it has escaped his observation altogether, that the inner margin where the two teeth come in contact has the principal cutting edge.

Mr. G. R. Waterhouse was aware of the inner trenchant margin as in his "Natural History of the Mammalia," he refers to these incisors as having "cutting external and internal margins." Further on he says—"In *Macropus major* (and, perhaps, in some nearly allied species), the rami of the lower jaw are loosely attached at the chin, and at the apex they are free, and the animal has the power of slightly separating the lower incisors, so that their outer cutting edges are brought more closely in contact with the upper incisors than they otherwise would be." Were this, however, the only utility of the loose attachment at the symphysis, what function has the cutting inner margin to perform?

An examination of those incisors will disclose the following facts:—

If the jaw of one of the macropidæ is examined immediately after death, when the muscles are relaxed, it is found that the smallest pressure upon the base of the rami suffices to open the lower incisors to the extent of about one-fourth of an inch in larger specimens, and about one-eighth in the smaller Pademelons or Halmaturi. The inner edges of the procumbent teeth will then be seen to be sharp, but strongly supported by a considerable thickness of enamel immediately in rear of the edge, and when the teeth are united by the contraction of the muscles, they fit so perfectly throughout their whole length that they will grasp a hair at any point between the base and the apex. On the other hand, the outer margins of these teeth are blunt and somewhat rounded, and when the jaw is closed and at rest, instead of fitting on to the teeth of the upper jaw, as represented in diagrams in Owen's "Odontography," the

two procumbent teeth rest upon a pad or projecting palate which rises from the inner base of the upper incisors, and whose surface is nearly upon the level of the edges of the upper teeth themselves; the lower incisors, therefore, are only brought into contact with the upper incisors by protruding the jaw forward.

I have, moreover, examined many specimens of the *Macropus major*, or kangaroo, and of varieties of the Halmaturus known as wallabies and pademelons, when they have been mortally wounded and under the influence of the spasmodic muscular contractions which occur at the point of death, and I have repeatedly found that they will alternately open the two incisors to their full extent, and unite them again with the energy which characterises all the muscular movements of an animal in its death-struggle.

If a small object, for instance the blade of a knife, is inserted between the teeth when fully extended, the animal will immediately grasp it with its incisors, which he will do without closing the jaw, showing that the movement is not absolutely dependent upon the action of closing the jaws, although, as I have said above, I believe it usually accompanies it.

The Phalangists or Australian opossums closely resemble the macropidæ in their dental formation, but they possess partially-developed canines in the upper jaw, whilst the latter have none in either jaw except in very early life; but although these opossums have their two procumbent incisors similarly situated, they probably do not possess the power of utilising them in the same manner; I have examined some specimens, but have failed so far to find more than the looseness of connection at the symphysis referred to by Prof. Owen.

In the genus which is represented by the Phascolarctos or native bear of Australia, which possesses the same lower incisors but distinct canines in the upper jaw, this arrangement is certainly wanting, as the rami of the lower jaw are firmly united.

This remarkable formation of the lower jaw of these kangaroos and wallabies is possibly an interesting instance of the retention of a construction, and of a set of muscles in a class of animals which have constantly required their aid to sustain life, which in other families of the animal kingdom have become rigid by ossification and cartilaginous formations, and by atrophy of the muscles in consequence of disuse.

The great plains and deserts over which these marsupials wander in search of food afford an exceedingly precarious supply of pasture in consequence of droughts and bushfires, which not unfrequently follow a superabundance of herbage. These animals, by means of their procumbent teeth which they make use of as shears, are thus enabled to cut off any green shoots or half-buried remains spared by a scorching sun, and obtain nourishment where any grass-feeding placental would certainly starve.

It is in consequence, I believe, of the power which is by this means given to these marsupials of eating scanty pasturage closer to the ground than any other animal, that in the great pastoral districts of New South Wales and Queensland it has been found that they are far more destructive of food than any stock that can be put upon the land, and in places where wallabies and pademelons are exceedingly numerous, it is noticeable that the native grasses in the particular localities which they frequent become completely destroyed, and that such places remain ungrassed until fresh seed is scattered over them by the winds.

HENRY WELD BLUNDELL

Gordon Downs, Queensland, December 5, 1878

Measuring the Velocity of Sound in Air

THE following simple way of arriving at the velocity of sound in air occurred to me lately:—Standing on a straight staircase between two blank walls (brick, and papered), which I find to be 32½ inches apart, I clap my hands. The effect from each clap is a brief musical sound, metallic in character, and of quite appreciable pitch. It arises, doubtless, from the disturbance travelling to and fro between the walls. The pitch I find to be, as nearly as possible, G sharp (in the fourth space). Now, the number of *complete* vibrations per second, corresponding to this note, seems to be about 205 (see Deschanel's "Natural Philosophy," p. 820). This implies that the disturbance, when I clapped my hands, made 410 excursions across the space per second. Consequently, 410 × 32½ = 13,325 inches = 1,100 feet. This is exactly the number Deschanel gives as the velocity of sound in air at 50° (approximately our mean annual temperature).

M.

Snow Flakes

WHILST walking home on March 26, about one in the morning, snow began to fall very gently; but instead of the usual powdery or feathery appearance, each flake consisted of a distinct plate, in some cases perfect six-pointed crystals. I measured some of them, and the largest were as much as five-eighths of an inch across. On taking up a handful the appearance was still more remarkable; instead of the white opaque body one usually sees, the mass was pearly and semi-transparent, and so strongly resembling boracic acid, that I should have had some difficulty in distinguishing a handful of each substance by sight alone.

Near the lamps the effect was very beautiful, more especially when the road became covered, luminous points appearing in all directions, which scintillated like stars as one walked along, whilst many of the falling crystals reflected iridescent hues on nearing the ground.

When out of the town I ignited a piece of magnesium wire, and the effect was most brilliant.

It was a cold, dull night, barometer falling.

Burton-on-Trent FRANK E. LOTT

Rats and Water Casks

IN 1840, in a voyage from Sydney, *viâ* Madras, to London, about three weeks after leaving the latter, it was found that a number of water-butts, on their heads in the between-decks, were leaking. On examining them we ascertained that as many as ten or twelve butts had been perforated by rats; three or four were entirely empty from the leakage so caused, while the remainder contained ullages from about half to a few gallons. In every case the stave had been eaten through just above the chime hoop, and those which had been apparently most recently operated on had only been perforated so as to cause a slight weeping, while the empty ones showed an opening as large as an ordinary vent-peg hole. The rest of the voyage a tub placed in the square of the main hatchway was kept constantly supplied with water, besides one or more square tins of water on the main deck.

In the above voyage we stayed a week in Madras, and in loosing the foretop-gallant-sail on leaving, a rat and five or six young ones fell to the deck; and the sail was found to be so much eaten and full of holes, made to form and line the nest, that the sail had to be unbent and replaced.

Gurnet Bay, March 31 E. J. A'COURT SMITH

P.S.—The ship was the *Cornwall*, East Indiaman, Capt. Cow.

HEINRICH WILHELM DOVE

PROF. HEINRICH WILHELM DOVE was born at Liegnitz, Silesia, on October 6, 1803, and at the age of eighteen passed from the schools of that town to the Universities of Breslau and Berlin, where for the next three years he devoted himself assiduously to the study of mathematics and physics. In 1826 he took his degree of Doctor of Philosophy, his thesis on the occasion being an inquiry regarding barometric changes; and it is further significant of his future life-work that his first published memoir was a paper on certain meteorological inquiries relative to winds, these two subjects holding a first place in the great problem of weather-changes.

Dove began his public life as tutor and Professor at Königsberg, where he remained till 1829, being then invited to Berlin as supplementary Professor of Physics. His strikingly clear-sighted, bold, and original intellect turned instinctively to that intricate group of questions in the domain of physics which comprise the science of meteorology, and his success in these fields as an original explorer was so marked and rapid that he soon achieved for himself a seat in the Royal Academy of Sciences, and some time thereafter was raised to the distinguished position of the Chair of Physics in the University of Berlin.

Among the scientific and fashionable circles of Berlin he took first rank as a lecturer, the combined qualities of accurate science, fine imagination, lucidity of style, com-